



Population Dynamics of Thrips, PBND, PSND in Different Groundnut Ecosystems

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ABSTRACT

A roving survey was conducted during *Kharif*, 2011 and recorded the incidence of thrips, Peanut Bud Necrosis Disease (PBND) and Peanut Stem Necrosis Disease (PSND) on groundnut in six mandals of Chittoor and Ananthapur districts with five villages in each mandal and five farmer fields per each village were selected. The roving survey was conducted at five different stages of the crop viz., vegetative, flowering, pegging, pod formation and pod developmental stages. In Chittoor and Ananthapur districts which revealed that the thrips damage was high during vegetative stage to peg penetration stage while the PBND incidence was noticed from flowering stage to pod formation stage. With regard to PSND the disease incidence was more in Ananthapur district compared to Chittoor district particularly during *kharif*, 2011.

Key words : Groundnut, Population dynamics, Thrips.

Groundnut (*Arachis hypogaea* L.) is a leading oilseed crop in India and, tropical and subtropical regions of the world. The most important groundnut growing countries are India, China, Nigeria, Sudan and USA. In the world, the crop is grown in an area of 26.62 million ha by 84 countries with an annual production of 35.66 million tonnes with a productivity of 1348 kg ha⁻¹. In India, it is grown in an area of 4.19 million ha with a production of 5.62 million tonnes and the average productivity of about 1341 kg ha⁻¹ per annum (Department of Agriculture and Cooperation, Ministry of Agriculture, Govt. of India, 2012). Pests and diseases are the major biotic factors affecting the groundnut yield. Groundnut crop is attacked by lepidopteran as well as sucking pests. Among the sucking pests attacking the groundnut crop, thrips species form a major complex, starting from vegetative stage till the harvest of the crop. Ghewande (1987) recorded the yield loss due to thrips to the tune of 17 to 40 per cent in Gujarat.

Upadhyay and Vyas (1983) recorded 28 and 22.5 per cent losses by thrips during *Kharif* and summer seasons, respectively. Weather based pest and disease forewarning models have been developed to certain extent (Singh *et al*, 1990, Jayanthi *et al*, 1993 and Prasad *et al*. 2008).

However, development of a viable model for pest and disease forecast is the need of the hour for effective integrated pest management strategy.

MATERIAL AND METHODS

Roving survey was undertaken in hot spots of Chittoor (Southern zone) and Anantapur (Scarce rainfall zone) Districts of Andhra Pradesh where the groundnut crop was predominantly grown. In each district six mandals were selected, of which per mandal five villages and five fields per village were selected for recording the incidence of thrips, Peanut Bud Necrosis Disease (PBND) and Peanut Stem Necrosis Disease (PSND) at different stages of crop growth viz., vegetative, flowering, peg penetration, pod formation and pod developmental stages. The data on total plants, PBND, PSND infected plants per square meter and thrips damaged leaves per ten plants were selected at random and recorded in each field.

Recording Thrips Incidence

For recording thrips incidence in groundnut crop, 10 healthy plants were selected at random, where, the total number of leaves and the number of leaves damaged due to thrips were counted per each plant and converted as per cent thrips

incidence. Thrips damaged leaves were identified by observing the small tiny white spots developed on the upper surface of the damaged leaves. The per cent thrips incidence was calculated by using the formula,

$$\text{Thrips incidence (\%)} = \frac{\text{No. of thrips damaged leaves}}{\text{Total leaves of the plant}} \times 100$$

Recording Peanut Bud Necrosis Disease (PBND) and Peanut Stem Necrosis Disease (PSND)

The Peanut Bud Necrosis Disease (PBND) in groundnut was observed starting from vegetative stage to pod development stage whereas the Peanut Stem Necrosis Disease (PSND) was observed from pegging stage to pod development stage. For which observations were recorded at regular intervals. The PBND infected plants were identified based on the symptoms like chlorotic spots, which later develop into chlorotic and necrotic rings and streaks on young leaflets. The necrosis from the leaf extends to the petiole and to the growing terminal bud. The leaflets showing the above symptoms become flaccid and droop. As a result of necrosis of terminal bud, various secondary symptoms like stunting and proliferation of auxiliary shoots occur. If plants are infected early, they are stunted and bushy. The leaflets on proliferated shoots are reduced in size and exhibit puckering, mosaic, mottling and sometimes chlorosis (Reddy *et al.*, 1995).

The PSND infected plants were identified based on the symptoms in groundnut which would first appear on young leaves as necrotic lesions and veinal necrosis. Necrotic lesions on the stem later spread upward killing the bud. Infection showed proliferation of auxiliary shoots which are small and show general chlorosis unlike the secondary symptoms of PBND, where distortion and mosaic mottling of leaf lamina are common, whereas the pods showed necrotic lesions (Prasada Rao *et al.*, 2003). The per cent PBND and PSND incidence was calculated by using the formula

$$\text{PBND (\%)} = \frac{\text{No. of PBND infected plants}}{\text{Total no. of plants in one sq. m area}} \times 100$$

$$\text{PSND (\%)} = \frac{\text{No. of PSND infected plants}}{\text{Total no. of plants in one sq. m area}} \times 100$$

RESULTS AND DISCUSSION

Kharif 2011 Chittoor district

Vegetative stage:

The incidence of thrips at vegetative stage from 25.46 per cent in Arantlapalli village (Punganur mandal), Nunevaripalli village (Palamaner mandal) to 40.44 per cent in Thogatapalli village of Kalikiri mandal. Among the six different mandals the mean thrips incidence was more in Kalikiri (35.84%) followed by Valmikipuram (34.05%), Gurramkonda (32.11%), Piler (33.09%), Palamaner (30.74%) and Punganur (30.0%).

Regarding PBND incidence the disease from 1.22 per cent in Avulavaripalli village of Punganur mandal to 2.52 per cent in Gajulavaripalli village of Gurramkonda mandal. Among the six different mandals, the mean incidence of PBND was more in Gurramkonda mandal (1.91%) followed by Kalikiri (1.68%), Punganur (1.6%), Palamaner (1.59%), Valmikipuram (1.53%) and Piler (1.45%). The incidence of PSND was noticed during vegetative stage of groundnut in all the six mandals.

Flowering Stage:

During flowering stage the survey results revealed that the thrips incidence from 12.54 per cent in Nunevari Palli village (Palamaner Mandal) to a maximum of 28.95 per cent in Thogatapalli village (Kalikiri mandal). Among the six different mandals, the mean foliar damage of thrips was high in Kalikiri mandal (25.65%) followed by Valmikipuram mandal (22.76%), Punganur (17.90%), Gurramkonda (17.07%), Piler (16.56%) and Palamaner (14.46%).

The PBND incidence at flowering stage ranged from 1.38 per cent in Vaddipalli village (Valmikipuram Mandal) to 5.57 per cent in Akkimvaripalli village of Punganur mandal. The mean per cent PBND incidence in six different mandals was 3.77 per cent in Punganur, 2.80 per cent in Piler, 2.49 per cent in Palamaner, 2.47 per cent in Gurramkonda, 2.44 per cent in Kalikiri and 1.83 per cent in Valmikipuram Mandal. The PSND incidence was not noticed during flowering stage.

Pegging Stage:

The foliar damage by thrips at pegging stage ranged from 6.38 per cent in Nalagampalli village of Palamaner mandal to a maximum of 18.23 per

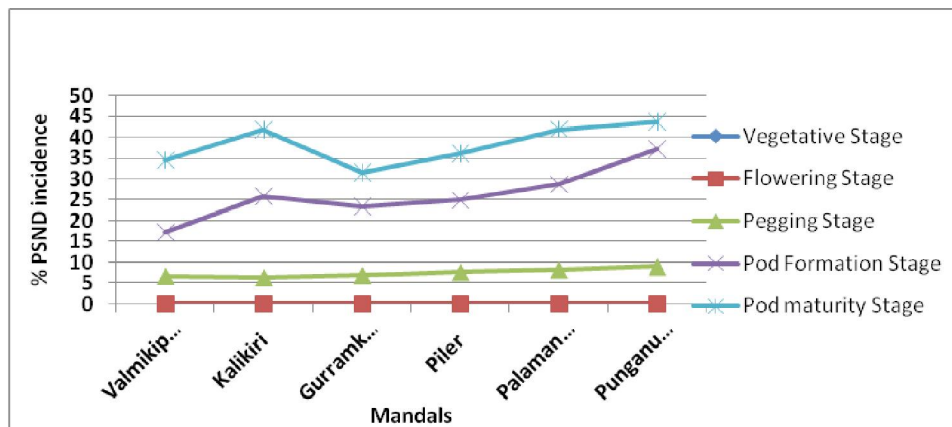
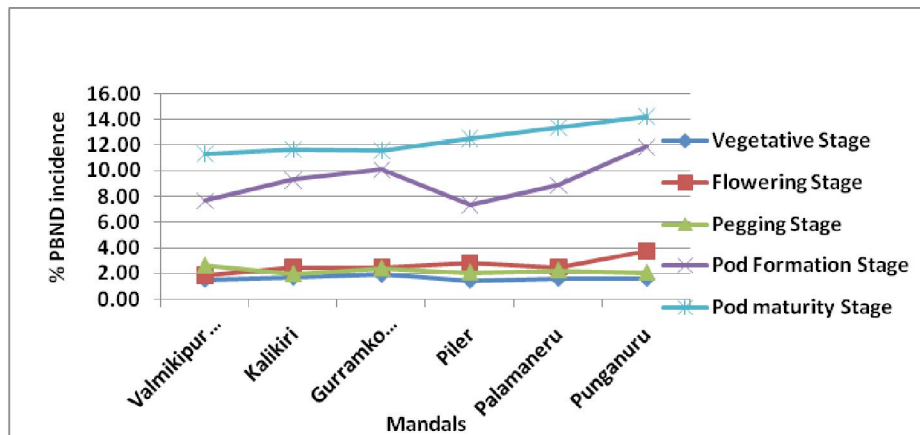
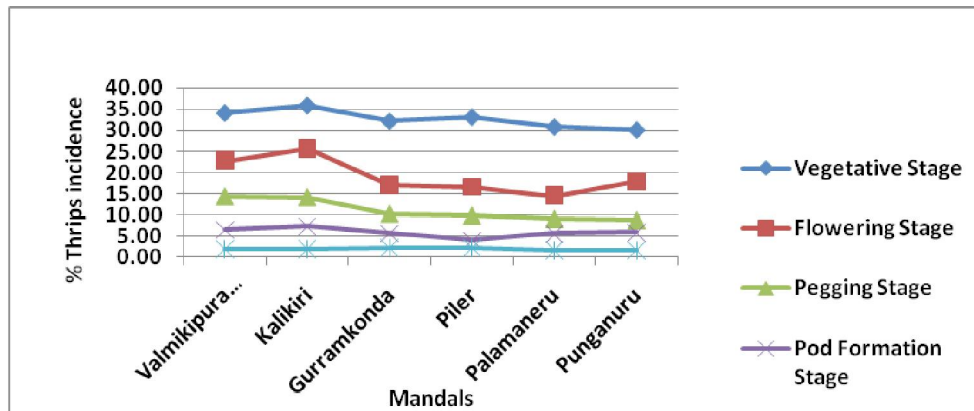


Fig. 1. Survey for incidence of Thrips, PBND and PSND on Groundnut in Chittoor district during *Kharif*, 2011.

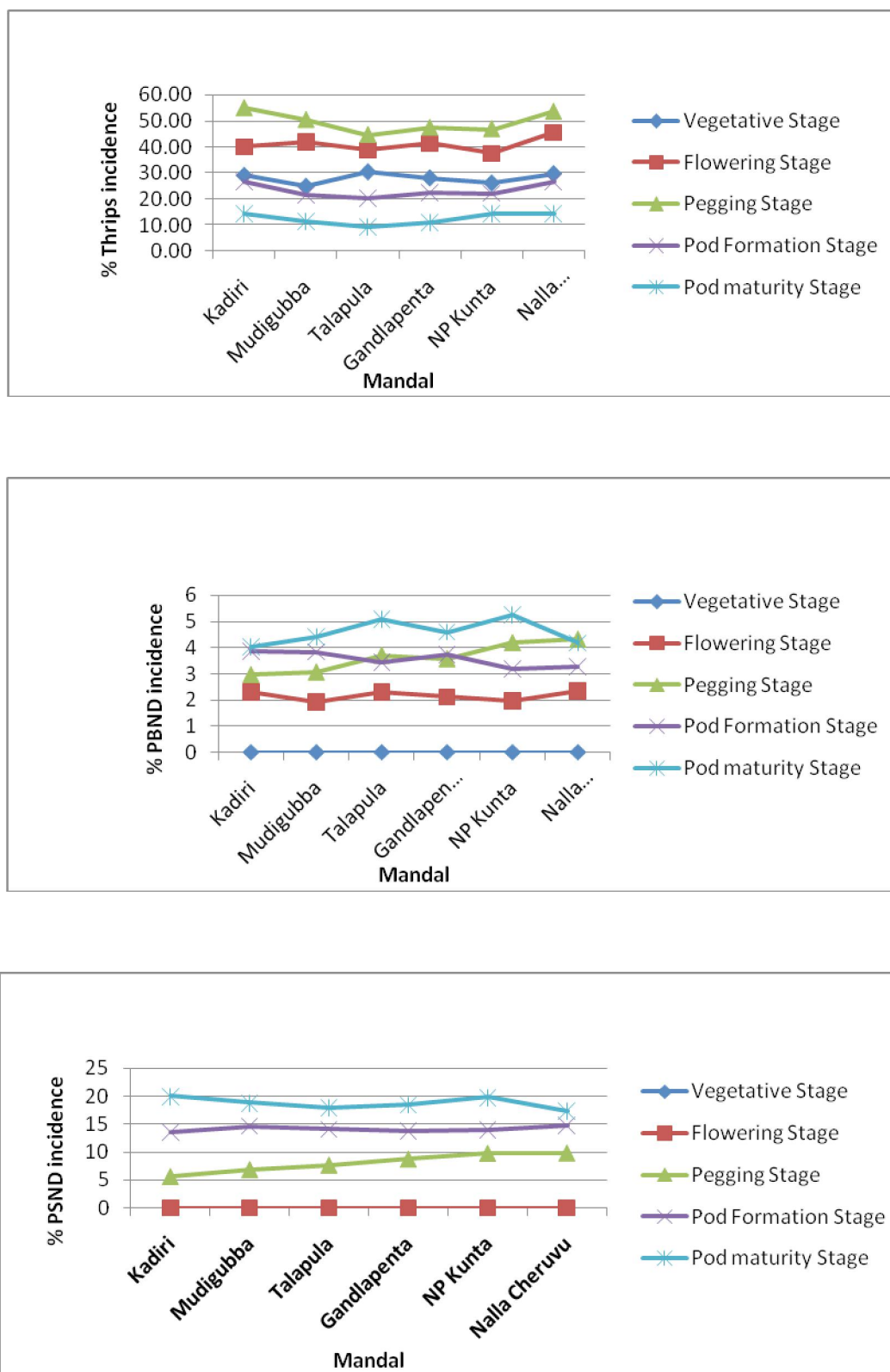


Fig. 2. Survey for incidence of Thrips, PBNB and PSND on Groundnut in Anantapur district during kharif, 2011.

cent in Kambhamvaripalli village of Kalikiri mandal. Among the six different mandals the mean thrips incidence was high in Valmikipuram mandal (14.38 per cent) followed by in Kalikiri (14.23 per cent), in Gurramkonda (10.35 per cent), in Piler (9.94 per cent), in Palamaner (9.13 per cent) and in Punganur (8.83 per cent).

The range of PBNB incidence during pegging stage was 1.09 per cent in Barinepalli of Punganur mandal to a maximum of 2.98 per cent in Gandlapalli village of Valmikipuram mandal. Among the six different mandals, the mean PBNB incidence was maximum in Valmikipuram mandal (2.62%) followed by Gurramkonda (2.4%), Palamaner (2.24%), Piler (2.09%), Punganur (2.07%) and Kalikiri (1.99%).

The PSND incidence was noticed from the pegging stage and it ranged from 4.56 per cent in Kottapalli village (Valmikipuram mandal) to 10.33 per cent in Arantlapalli village (Punganur mandal). Among the six different mandals, the mean per cent incidence of PSND was maximum in Punganur (8.93%) followed by Palamaner (8.19%), Piler (7.59%), Gurramkonda (6.90%), Valmikipuram (6.63%) and Kalikiri (6.34%).

Pod Formation Stage:

At pod formation stage, the incidence of thrips was noticed to the extent of 2.58 per cent in Balijapalli village of Piler Mandal to a maximum of 8.24 per cent in Gollavaripalli village of Kalikiri Mandal. The mean thrips incidence among six different mandals was 7.32 per cent in Kalikiri, 6.53 per cent in Valmikipuram, 5.84 per cent in Punganur, 5.58 per cent in Gurramkonda, 5.56 per cent in Palamaner and 4.02 per cent in Piler.

The PBNB incidence ranged from 4.56 per cent in Mulapalli village of Piler mandal to 13.85 per cent in Avulavaripalli village of Punganur Mandal. Among the six different mandals, the PBNB incidence was maximum in Punganur (11.88%) followed by Gurramkonda (10.11%), Palamaner (8.9%), Kalikiri (8.9%), Valmikipuram (7.69%) and Piler (7.35%).

The PSND incidence ranged from 14.56 per cent in Reddivaripalli village of Valmikipuram mandal to 41.56 per cent in Arantlapalli village of Punganur mandal. The mean PSND incidence

among six different mandals was maximum in Punganur (37.26%) followed by Palamaner (28.72%), Kalikiri (25.78%), Piler (24.89%), Gurramkonda (22.42%) and Valmikipuram (17.09%).

Pod Development Stage:

The foliar damage by thrips at pod developmental stage was very low as it was from the range of 1.09 per cent in Gandlapalli village of Valmikipuram mandal to 2.75 per cent in Kuruvapalli village of Gurramkonda mandal. The mean thrips incidence among the six different mandals revealed that the foliar damage was very low in Palamaner (1.65%) followed by Punganur (1.72%), Valmikipuram (1.83%) Kalikiri (1.95%), Gurramkonda (2.08%) and Piler (2.14%).

The PBNB incidence ranged from 9.42 per cent in Kaluva palli village of Palamaner mandal to 16.89 per cent in Arantlapalli village of Punganur mandal. Among six different mandals, the mean PBNB incidence was maximum in Punganur (14.21%), Palamaner (13.34%), Piler (12.5%), Kalikiri (11.64%), Gurramkonda (11.52%) and Valmikipuram (11.28%).

Among all the five different stages of crop growth the PSND incidence was very high at pod developmental stage compared to PBNB during *Kharif* 2011 in Chittoor District. The PSND incidence ranged from 28.66 per cent in Rudravaripalli village of Gurramkonda mandal to 53.42 per cent in Arantlapalli village of Punganur mandal. The mean value of PSND incidence among the six different mandals was maximum in Punganur (43.75%), followed by Palamaner (41.93%), Kalikiri (41.87%), Piler (36.21%), Valmikipuram (34.46%) and Gurramkonda (31.53%).

The results of present investigations are supported by the Annual reports of RARS, Tirupati (2004) who reported the thrips incidence from 1-4 scale in Chittoor district during *kharif* 2003 while the PBNB and PSND ranged from 0 to 0.4 and 0 to 7.0 per cent, respectively. The present investigation indicates that the incidence of PBNB and PSND was increasing enormously which might be due to the impact of climate change on thrips multiplication.

Kharif 2011: Anantapur District**Vegetative Stage:**

The incidence of thrips at vegetative stage ranged from 20.16 per cent in Dinnevaripalli village (NP Kunta mandal), to 37.15 per cent in Bandlapalli village of Talapula mandal. Among the six different mandals the mean thrips incidence was more in Talapula (30.44%) followed by Nallacheruvu (29.71%), Kadiri (29.08%), Gandlapenta (28.12%), NP Kunta (26.23%) and Mudigubba (25.02%). The incidence of PBNB and PSND was not noticed during vegetative stage of groundnut in all the six mandals.

Flowering Stage:

During flowering stage the survey results revealed that the thrips damage was to the range of 36.69 per cent in Patnam village (Kadiri Mandal) and to a maximum of 48.27 per cent in Kondaguttapalli village (Mudigubba mandal). Among the six different mandals the mean foliar damage of thrips was high in Nallacheruvu (45.51%) followed by Mudigubba (41.89%), Gandlapenta (41.39%), Kadiri (40.10%), Talapula (38.71%) and NP Kunta (37.55%).

The PBNB incidence at flowering stage ranged from 1.25 per cent in Mallammakottala village (Mudigubba Mandal) to 2.98 per cent in Kutagulla village of Kadiri mandal. The mean per cent of PBNB incidence in six different mandals was 2.33 per cent in Nallacheruvu, 2.30 per cent in Kadiri, 2.27 per cent in Talapula, 2.10 per cent in Gandlapenta, 1.96 per cent in NP Kunta and 1.91 per cent in Mudigubba. The PSND incidence was not noticed during flowering stage in all the mandals.

Pegging Stage:

The foliar damage by thrips at pegging stage ranged from 42.75 per cent in Yerravankapalli village of NP Kunta mandal to a maximum of 60.63 per cent in Veepurupalli village of Kadiri mandal. Among the six different mandals the mean thrips incidence was more in Kadiri (54.91 per cent) followed by in Nallacheruvu (53.54 per cent), in Mudigubba (50.37 per cent), in Gandlapent (47.35 per cent), in NP Kunta (46.85 per cent) and in Talapula (44.58 per cent).

The PBNB incidence during pegging stage ranged from 1.56 per cent in Patnam of Kadiri mandal to a maximum of 4.96 per cent in Kallepalli village of Nallacheruvu mandal. Among the six different mandals, the mean PBNB incidence was maximum in Nallacheruvu (4.32%) followed by NP Kunta (4.19%), Talapula (3.71%), Gandlapenta (3.58%), Mudigubba (3.08%) and Kadiri (2.98%).

The PSND incidence was noticed from the pegging stage and it ranged from 3.24 per cent in Sanevaripalli village (Mudibba mandal) to 10.98 per cent in Kallepalli village (Nallacheruvu mandal). Among six different mandals, the mean per cent incidence of PSND was maximum in Nallacheruvu (9.87%) followed by NP Kunta (9.80%), Gandlapenta (8.78%), Talapula (7.71%), Mudigubba (6.91%) and Kadiri (5.66%).

Pod Formation Stage:

At Pod formation stage, the incidence of thrips ranged from 15.39 per cent in Patnam village of Kadiri Mandal to a maximum of 39.24 per cent in Veepurupalli village of Kadiri Mandal. The mean Thrips incidence among six different mandals was in Kadiri (26.63 per cent), in Nallacheruvu (26.51 per cent), in Gandlapenta (22.36 per cent), in NP Kunta (22.11 per cent), in Mudigubba (21.40 per cent) and in Talapula (20.20 per cent).

The PBNB incidence was in the range from 2.56 per cent in Oruvai village of Nallacheruvu mandal to 4.98 per cent in Kondaguttapalli village of Mudigubba Mandal. The PBNB incidence among six different mandals was maximum in Kadiri (3.86%) followed by Mudigubba (3.83%), Gandlapenta (3.73%), Talapula (3.45%), Nallacheruvu (3.26%) and NP Kunta (2.96%).

The PSND incidence ranged from 12.18 per cent in Kutagulla village of Kadiri mandal to 16.46 per cent in Oruvai village of Nallacheruvu mandal. The mean PSND incidence was maximum in Nallacheruvu (14.76%) followed by Mudigubba (14.64%), Talapula (14.04%), NP Kunta (13.92%), Gandlapenta (13.73%) and Kadiri (13.48%) among the six different mandals.

Pod Developmental Stage:

The foliar damage by thrips at pod developmental stage ranged from 7.27 per cent in Byragipalli village of Talapula to 18.27 per cent in

Table 1. Survey for incidence of Thrips, PBND and PSND on Groundnut in Chittoor district during *Kharif*, 2011.

S.No	Mandal	Village	VEGETATIVE STAGE			FLOWERING STAGE			PEGGING STAGE			POD FORMATION			POD DEVELOPMENT		
			Thrips damage	PBND	PSND	Thrips damage	PBND	PSND	Thrips damage	PBND	PSND	Thrips damage	PBND	PSND	Thrips damage	PBND	PSND
			% Incidence of			% Incidence of			% Incidence of			% Incidence of			% Incidence of		
1	Valmikipuram	Reddyvaripalle	26.78	1.62	-	17.82	1.66	-	12.37	2.33	8.48	6.66	7.69	14.56	1.55	15.48	29.96
		Kothapalli	32.37	1.66	-	25.46	1.78	-	14.94	2.55	4.56	7.56	6.55	16.88	2.05	10.25	32.85
		Vaddipalli	30.39	1.54	-	26.09	1.38	-	15.38	2.65	8.69	5.58	7.98	17.68	1.84	9.98	39.48
		Gandlapalli	38.75	1.45	-	24.37	1.47	-	13.53	2.98	4.65	6.64	6.65	15.36	1.09	11.25	34.56
		Ayyavaripalli	41.95	1.36	-	20.04	2.88	-	15.68	2.58	6.77	6.23	9.58	20.96	2.64	9.45	35.43
		Mean	34.05	1.53	-	22.76	1.83	-	14.38	2.62	6.63	6.53	7.69	17.09	1.83	11.28	34.46
		Thogatapalli	40.44	1.6	-	28.95	3.59	-	12.66	1.55	8.58	6.96	10.88	24.65	2.55	12.54	39.84
		Parapatta	36.78	1.44	-	24.41	2.96	-	9.93	1.63	4.78	7.59	7.54	25.63	1.53	11.87	42.54
		Medikurty	29.78	1.88	-	25.57	1.53	-	14.86	1.68	4.96	6.85	8.54	23.54	1.86	10.47	38.26
		Gollavaripalli	37.77	1.74	-	27.1	1.46	-	15.46	2.59	6.78	8.24	8.96	26.55	1.88	11.46	43.46
2	Kalikiri	Kambhamvari palle	34.45	1.76	-	22.24	2.68	-	18.23	2.44	6.58	6.95	10.54	28.55	1.95	11.86	45.24
		Mean	35.84	1.68	-	25.65	2.44	-	14.23	1.98	6.34	7.32	9.29	25.78	1.95	11.64	41.87
		Tharigonda	34.48	2.34	-	20.25	2.88	-	10.33	1.95	7.36	4.38	11.26	20.88	1.85	12.78	29.34
		Rudravaripalli	32.49	1.26	-	18.75	2.67	-	12.96	1.89	9.65	5.16	11.35	21.66	1.94	12.54	28.66
		Kuruva Palle	31.49	1.77	-	16.33	1.44	-	8.38	2.85	4.78	6.85	9.48	24.44	2.75	10.28	30.48
		Gajulavaripalli	29.78	2.52	-	14.28	2.78	-	10.22	2.87	5.95	6.98	8.96	23.78	1.56	11.49	32.64
		Ramapuram	32.29	1.65	-	15.75	2.59	-	9.84	2.44	6.77	4.54	9.48	26.36	2.28	10.53	36.52
		Mean	32.11	1.91	-	17.07	2.47	-	10.35	2.4	6.9	5.58	10.11	23.42	2.08	11.52	31.53
		Baliapalli	30.19	1.46	-	15.72	2.52	-	11.98	2.47	8.88	2.58	6.65	18.46	2.65	9.86	28.84
		Mulapalle	37.78	1.22	-	16.35	2.98	-	9.65	2.52	4.68	4.95	4.56	24.32	1.98	10.87	31.58
3	Gurramkonda	Vengamagaripalle	31.49	1.48	-	13.25	2.36	-	8.35	1.59	6.98	4.18	8.87	27.48	2.58	11.58	39.48
		Yeguva Kothapalli	36.51	1.5	-	21.18	2.48	-	11.26	2.36	7.66	3.85	6.89	24.65	1.54	15.63	34.62
		Talupula	29.46	1.58	-	16.28	3.66	-	8.48	1.49	9.77	4.56	9.78	29.56	1.96	14.57	46.52
		Mean	33.09	1.45	-	16.56	2.8	-	9.94	2.09	7.59	4.02	7.35	24.89	2.14	12.5	36.21
		Kaluvapalli	34.46	1.54	-	14.28	1.26	-	7.62	2.25	7.58	5.96	8.84	25.96	1.62	9.42	39.65
		Pengaragunta	31.05	1.79	-	10.69	1.54	-	8.48	1.58	9.45	6.75	7.85	28.66	1.73	10.56	42.84
		Nalagampalli	35.46	1.28	-	16.3	2.88	-	6.38	1.95	6.48	4.25	6.48	24.88	1.12	11.85	39.98
		Gopalapuram	27.28	1.65	-	18.5	1.43	-	10.92	2.46	7.77	5.88	9.48	29.44	1.93	13.24	40.23
		Nunevaripalli	25.46	1.68	-	12.54	5.33	-	12.24	2.98	9.66	4.94	11.86	34.65	1.84	21.65	46.97
		Mean	30.74	1.59	-	14.46	2.49	-	9.13	2.24	8.19	5.56	8.9	28.72	1.65	13.34	41.93
4	Punganuru	Arantlapalli	25.46	1.88	-	16.91	2.58	-	6.88	2.28	10.33	5.62	11.26	41.56	1.77	16.89	53.42
		Kammavaripalli	29.12	1.82	-	14.75	2.45	-	7.26	2.66	7.55	4.43	12.86	38.98	1.62	15.59	39.62
		Avulavaripalli	33.35	1.22	-	22.25	3.65	-	9.27	2.45	8.89	5.97	13.85	40.66	1.36	14.55	41.28
		Barinepalli	30.78	1.49	-	16.67	4.58	-	12.48	1.09	9.23	7.26	10.46	29.44	2.68	12.56	39.46
		Akkimvarimvaripalli	31.29	1.57	-	18.94	5.57	-	8.27	1.88	8.66	5.91	10.98	35.66	1.16	11.48	44.97
		Mean	30	1.6	-	17.9	3.77	-	8.83	2.07	8.93	5.84	11.88	37.26	1.72	14.21	43.75

Table 2. Survey for incidence of Thrips, PBND and PSND on Groundnut in Anantapur district during *Kharif*, 2011.

S.No	Mandal	Village	VEGETATIVE STAGE % Incidence of			FLOWERING STAGE % Incidence of			PEGGING STAGE % Incidence of			POD FORMATION % Incidence of			POD DEVELOPMENT STAGE % Incidence of		
			Thrips damage	PBND	PSND	Thrips damage	PBND	PSND	Thrips damage	PBND	PSND	Thrips damage	PBND	PSND	Thrips damage	PBND	PSND
1	Kadiri	Patnem	28.23	-	-	36.69	1.56	-	45.79	1.56	3.56	15.39	3.23	12.25	9.23	3.44	17.52
		Muthyala cheruvu	32.39	-	-	41.08	2.28	-	55.69	2.89	5.28	24.24	2.58	13.28	14.36	4.56	18.82
		Kutagulla	24.26	-	-	44.49	2.98	-	57.29	2.22	4.36	29.25	3.96	12.18	16.72	3.48	22.18
		Veepurupalli	28.27	-	-	39.56	2.23	-	60.63	3.54	6.24	39.24	4.56	15.26	18.27	4.68	24.56
		P.Nagireddipalli	32.25	-	-	38.68	2.45	-	55.13	4.69	8.86	25.01	4.97	14.42	12.71	3.96	16.89
		Mean	29.08	-	-	40.1	2.3	-	54.91	2.98	5.66	26.63	3.86	13.48	14.26	4.02	19.99
		Sanevaripalli	21.98	-	-	39.37	1.65	-	49.54	2.25	3.24	20.27	2.59	15.98	12.75	4.97	20.26
		Mallammakuttala	24.47	-	-	47.26	1.25	-	52.25	2.87	3.96	24.63	3.54	15.36	11.34	3.85	18.92
		Kondagutta palli	29.46	-	-	48.27	2.84	-	56.37	3.54	8.94	19.44	4.98	12.98	9.27	3.98	16.18
		Yerrahguntapalli	22.07	-	-	40.13	2.54	-	48.01	3.98	9.88	20.17	4.52	14.66	10.05	4.12	16.96
2	Mudigubba	Kodavandlapalli	27.11	-	-	34.4	1.29	-	45.69	2.78	8.52	22.48	3.52	14.22	13.17	5.12	21.88
		Mean	25.02	-	-	41.89	1.91	-	50.37	3.08	6.91	21.4	3.83	14.64	11.32	4.41	18.84
		Upparavandlapalli	21.77	-	-	30.39	2.67	-	40.28	3.56	6.65	16.37	3.64	15.68	7.12	4.52	15.16
		Kotannagaripalli	29.43	-	-	37.18	2.86	-	45.39	2.89	5.52	23.54	2.98	14.88	9.11	4.87	17.88
		Byragipalli	34.11	-	-	44.14	2.48	-	47.23	3.89	8.15	18.59	2.84	12.96	7.27	4.53	15.22
		Bandlapalli	37.15	-	-	44.69	1.58	-	45.56	3.64	7.98	20.29	3.56	14.58	10.36	5.54	18.68
		Nutanakalva	29.72	-	-	37.15	1.78	-	44.44	4.59	10.26	22.22	4.22	12.12	12.23	5.98	22.75
		Mean	30.44	-	-	38.71	2.27	-	44.58	3.71	7.71	20.2	3.45	14.04	9.22	5.09	17.94
		Rekkamanu Cross	25.55	-	-	40.44	1.98	-	46.29	2.94	5.55	20.17	2.99	13.16	8.29	5.56	16.28
		Gopalapuram	29.16	-	-	37.29	2.46	-	47.08	2.58	8.74	24.29	3.54	12.92	9.12	4.66	17.66
3	Talapala	Obulareddyapalli	30.39	-	-	46.07	2.65	-	50.25	3.57	8.18	22.58	4.62	14.46	10.33	3.94	19.76
		Pallevandlapalli	26.11	-	-	39.15	1.54	-	46.48	4.23	10.56	24.48	3.97	13.76	12.85	4.63	18.88
		Chinaganipalli	29.37	-	-	44	1.89	-	46.66	4.59	10.85	20.28	3.55	14.35	14.49	4.22	19.72
		Mean	28.12	-	-	41.39	2.1	-	47.35	3.58	8.78	22.36	3.73	13.73	11.02	4.6	18.46
		Javakala	26.79	-	-	37.38	2.15	-	46.26	4.54	9.96	21.39	2.88	13.25	14.31	4.55	19.92
		Peddapalli	31.42	-	-	38.39	1.96	-	49.26	3.98	10.25	27.29	3.45	14.75	16.36	4.84	20.25
		Velichalamala	28.31	-	-	40.46	2.36	-	50.55	4.44	10.55	24.34	2.98	14.98	15.17	5.56	18.19
		Yerravankapalli	24.45	-	-	33.59	1.52	-	42.75	3.87	8.35	20.22	3.64	12.11	10.37	4.98	19.96
		Dinnevaripalli	20.16	-	-	37.91	1.83	-	45.42	4.12	9.89	17.29	2.96	14.52	15.12	6.44	20.35
		Mean	26.23	-	-	37.55	1.96	-	46.85	4.19	9.8	22.11	3.18	13.92	14.27	5.27	19.73
4	Nalla Cheruvu	Thavalamarri	31.28	-	-	44.49	2.89	-	49.21	3.98	8.19	27.23	3.89	15.19	12.21	3.22	19.26
		Boyavandlapalli	29.37	-	-	46.78	2.56	-	50.59	4.56	9.35	24.33	3.64	14.26	17.21	3.98	20.93
		Chevitivaripalli	35.46	-	-	42.31	2.78	-	52.45	3.84	10.15	21.17	2.98	13.65	14.69	4.64	17.66
		Kallepalli	28.13	-	-	47.22	1.54	-	60.28	4.96	10.98	29.45	3.22	14.22	10.28	5.88	18.83
		Oruvai	24.33	-	-	46.75	1.89	-	55.17	4.28	10.66	30.35	2.56	16.46	17.26	3.22	10.19
		Mean	29.71	-	-	45.51	2.33	-	53.54	4.32	9.87	26.51	3.26	14.76	14.33	4.19	17.37

Veepurupalli village of Kadiri mandal. The mean thrips incidence among six different mandals revealed that the foliar damage was very low in Talapula (9.22%) followed by Gandlapenta (11.02%), Mudigubba (11.32%), Kadiri (14.26%), NP Kunta (14.27%) and Nallacheruvu (14.33%).

At pod developmental stage, the PBNB incidence was very low and was from the range of 3.44 per cent in Patnam village of Kadiri mandal to 6.44 per cent in Dinnevaripalli village of NP Kunta mandal. Among six different mandals, the mean PBNB incidence was maximum in NP Kunta (5.27%), Talapula (5.09%), Gandlapenta (4.60%), Mudigubba (4.41%), Nallacheruvu (4.19%) and Kadiri (4.02%).

Among all the five different stages of crop growth, the PSND incidence was very high at pod development stage compared to PBNB during *Kharif* 2011 in Anantapur District. The PSND incidence ranged from 10.19 per cent in Oruvai village of Nallacheruvu mandal to 24.56 per cent in Veepurupalli village of Kadiri mandal. The mean PSND incidence in six different mandals was maximum in Kadiri (19.99%), followed by NP Kunta (19.73%), Mudigubba (18.84%), Gandlapenta (18.46%), Talapula (17.94%) and Nallacheruvu (17.37%).

The results of the present investigations are in accordance with the results of Anonymous (2005) who reported the thrips damage from 1-4 scale while PBNB and PSND incidence ranged from 2 to 9 and 2 to 16.5 per cent respectively during *Kharif*, 2004.

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